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ABSTRACT

An innovative high school curriculum in Finland is designed so that the year is divided into six 6-week periods. In an experiment begun in fall 1989, English second language instruction was provided to second-year students in the form of content-area instruction in computer science, chemistry, and physics at one of two levels. Each course lasted for two 6-week periods, at the rate of 3 hours of instruction per week. It was found that most students adjusted quickly to classroom instruction in English. Demographic information about the students indicated that they were generally lower achievers in math and chemistry but achieved better in English. Student questionnaires revealed that, on the whole, the students were pleased with the program and had little language difficulty. Recommendations for improvement include better distribution of instructional materials, early distribution of a vocabulary list, reduction of the class's pace, and required use of English by students. Participants' school-leaving examination results show some overall improvement in English skills, and significant improvement in chemistry achievement, but little improvement in physics or computer science. (MSE)

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(Sept. 27, 1991)

CONTENT BASED LANGUAGE INSTRUCTION AT YLÖJÄRVI HIGH SCHOOL

A summary of impressions and findings to date from a CBLI project completed during the 1989-90 school year at a high school in Finland.

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BACKGROUND

Children learn language from context. They can learn a second or third language in the same way. Much of the current language learning theory suggests that this is indeed the most effective way for people of any age to learn a language.

The idea of teaching content to students in a "second language" is not new. First of all it happens naturally in cases where families move to a new country. That puts a rather old age tag on the idea. It has always worked well. When our family moved from Finland to Canada I was five years of age and had the chance to experience it for myself. I entered the first grade at an elementary school in Vancouver having been in Canada only a few months. That first year was intended primarily for me to learn English, but I succeeded in school well enough that at the end of the first school year I was moved on to the second grade. I have seen the same thing happen over and over again, as children who immigrated later were often my close friends. And there were no special teachers or classes for us back in those days. The first few weeks were tough, but the language was absorbed in a hurry. The fact that educators did not pick up the idea sooner, from the abundant evidence available is surprising.

It would seem that conscious and planned Content Based Language Instruction had its beginnings in the 1960's in Canada with French immersion programs. Since then, this concept has spread to the U.S. and elsewhere. There has been much talk in Finland in the late 80's about using this concept of teaching content in a second language. This would increase the amount of language exposure without having to increase hours of instruction. The Finnish Minister of Education (in 1988), Christopher Taxell, and the Rector of the University of Tampere, Jarmo Pukkila are among those who have advocated the teaching of content material in English.

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In the fall of 1988, I contacted Jussi Kytömäki, the computer science teacher at Ylöjärvi High School about the possibilities of this sort of teaching experiment. He spoke with the rector, Seppo Kykmälä and arranged our first meeting. From that point on we have planned and held meetings with different groups, such as parents, students, and administrators.

Our plan was to provide English instruction in the following second year high school courses: computer science; chemistry; and either general physics or half of the advanced level physic course.

Before Christmas of 1988, parents of the first year high school students were called to a meeting where the project was presented. Considerable discussion ensued both for and against the project, and we had serious doubts as to the possibilities for carrying the project out in its full scope. From the parent's questionnaire we could see that there was enough support to form a class or two of computer science, but the chemistry and physics seemed to be out of question. Earlier in the evening, the argument had been presented that "the terminology in the computer field is already English based so that instruction of this subject in English is almost natural."

We met with all of the first year high school students in February of 1989. When their wishes were tabulated, it became apparent that classes could be formed in all of the subject areas we had planned. Next followed the massive job of scheduling the students. The three classes of sophomore high school students had to be juggled to allow for students from each class to participate in the courses of their choosing. In the end we had to limit the number of students receiving English computer science instruction to two classes of 16 students each. We managed to get all the pieces put together to begin the actual teaching in the fall of 1989.

THE PROJECT UNDERWAY

Many of the Finnish high schools (including Ylöjärvi) are using an innovative class schedule system which involves dividing the school year into six 6-week periods. A given course can be complete in one 6-week period if enough hours are used for that course during that period. If less hours are used per week then the course can extend to two 6-week periods or more. All of the courses involved in this project were scheduled to last for two 6-week periods. This involved 3 hours of classroom instruction per week.

Instruction in two of the classes was started at the beginning of the second 6-week period, October 2, 1989. One class of 36 students (plus one exchange student) began the second year chemistry course, and another class of 17 students began the computer science course. Text books for the chemistry course had been ordered in September from England (via a book store). The books came in November, when the course was more than half over. Instructional materials for both course were either made from scratch, translated from Finnish text books, or copied from an array of English text books which I have on loan from the Namibia Project at Tampere Technical University in Hervanta.

TEACHER IMPRESSIONS AND QUESTIONNAIRE RESULTS

One of the few complaints which I have noticed from the chemistry class's returned post-course questionnaires, was the large amount of hand-out material. The other was the late arrival and general inadequacy of the text book for covering the course content dictated by the Finnish text.

Except for the problem of having to prepare huge amounts of hand out material in advance, the teaching of the classes progressed surprisingly normally. I had expected something to be different - something involved with teaching chemistry in a language which to the students was their second language.

The majority of the students adjusted very quickly to the class room instruction in English. This was my impression as the teacher, and it is also the conclusion reached from analyzing the post-course questionnaires.

A comparison of pre-course grades from related subjects presents interesting data about the students who chose CBLI, in particular the chemistry class students. On average these students are poorer at chemistry, and math, and better at English. Also their pre course questionnaires indicated that many of the students were looking for this course to help provide motivation to learn chemistry. Similar results were obtained by Lisa Washburn from a project at Röllingby Gymnasium a high school in Sweden, where math and science classes were taught in English for two years. 'preliminary results show that the T b class is average in technology, science and math but above average in language skills.'

Some conclusions can be drawn from the student questionnaires and from the teacher's own impressions of the project. First and surely most important - the students on the whole, were pleased with the CBLI. This was very clear from the questionnaires. Second - and almost as important- the language did not seem to be a factor creating difficulties for very many of the students. The post course questionnaires show that only a handful of students experienced any difficulty with the language.

Of course there were difficulties, but most of them would be easily corrected if this project were to be repeated. From the student responses it is apparent that the following improvements should be made.

First - text and handout material - any course text books should be on hand PRIOR to the start of classes, and handout material, if there is much of it, should be bound into a booklet for the students (this would now be possible after having done the course once).

Second - a vocabulary list of the most important terminology for the course should be made available to the students at the start of the course.

Third - the pace of the courses in both chemistry and physics would need to be slowed down, certainly not because the language was a problem, but to allow for the correction of assigned homework problems in class at the blackboard. There is no absolute necessity to complete all of the topics in the course outline, far better to do less well.

Finally - the student use of English. Because this was our first attempt at CBLI, we were not ready to put a requirement for the students to use English in class. This "we" includes both the teacher and students. Most of us would now want this requirement added. Many students indicated this on the questionnaires.

MATRICULATION EXAMINATION RESULTS

All of the students who participated in this spring's matriculation examinations were ranked on the bases of pre-project post-project evaluation data. These rankings are now being compared in order to determine if the CBLI might have had any measurable effect on the students' English skills. Sophomore English grade-point-averages (GPA) were used as pre-project data, and matriculation examination results in English (MERE) as post-project data. At the present time, the MERE results are split into the following three different catagories: Listening comprehension (LC); Text and Essay scores together (TeEs); and the total score for all the of the English matriculation examination parts combined (EngAll).

GPA - grade point average for Sophomore English
MERE - matriculation examination results
LC - listening comprehension part
TeEs - combined text and essay parts
EngAll - the total score for all parts of English exam

Figure 1. shows the results of plotting the GPA rank against the LC rank for all of the 50 students who were involved in the CBLI. A case located on the diagonal line indicates no change in rank. Any case above the line shows relative improvement (ie. that the student in question scored better on the LC part of the MERE then would have been predicted from his GPA). Any case below the line shows that the student was at a relatively higher rank position on the bases of his pre-project GPA then where his LC score now would rank him (ie. relative decrease).

The average change in rank for figure 1. is +3.54. This indicates some improvement in rank. This kind of data can be analyzed further using a statistical tool called a T-test. The T-test result gives us a probability factor (p) which in our case means the probability that the given change in rank is due to chance. In order to consider the results statistically significant to any extent the p factor should be less than 0.05. A 'p factor' of 0.01 or less is considered significant.

In the case of figure 1. the T-test gives a 'p' value of 0.0894. This means that there is about a 9% chance that this distribution of scores could have happened by chance. Not statistically significant. But look carefully at the graph again. Notice that eight of the nine cases to the far left are above the line (actually 10 students as two had identical rankings). These are the students who had GPA's of 9.0 or better for their first years English grades. If you are ranked at the top of the class prior to the CBLI the best you can hope for is to stay even. There is no chance for improving your rank. Another problem is that all five of the students with 10.0 GPA for Sophomore English were involved in the project. The control group had none. For these reasons it is always useful to look at these graphs twice. Once with and once without the 9.0 and better GPA students. The removal of the 10 top GPA students results in a 'p' score of 0.0206 or fairly significant for the rest of the 40 students involved.

Now let's look at figure 2. It is similar to figure 1. only the y-axis has the students relative rank with respect to EngAll. The average improvement in rank is 2.34 places, but the 'p' value is only 0.1023. Removal of the top ten students changes the 'p' value to 0.0197 or fairly significant once again.

The students who took CBLI can be grouped in ways other than on the bases of their English GPA. One way is to group them on the bases of how many classes of CBLI they took. Those who took more than one CBLI class did not fare any better than those who took only one. And once again the top students must be removed from the data to get anything near significant 'p' values.

Figure 1.

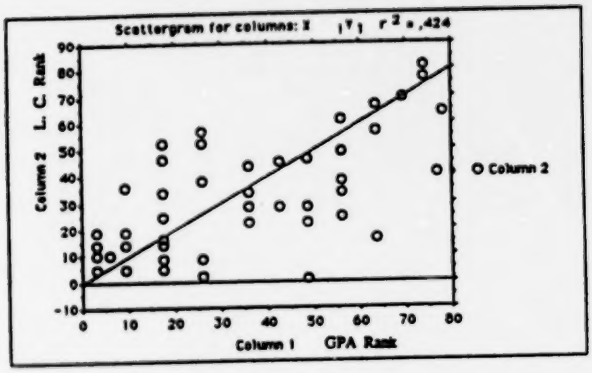


Figure 2.

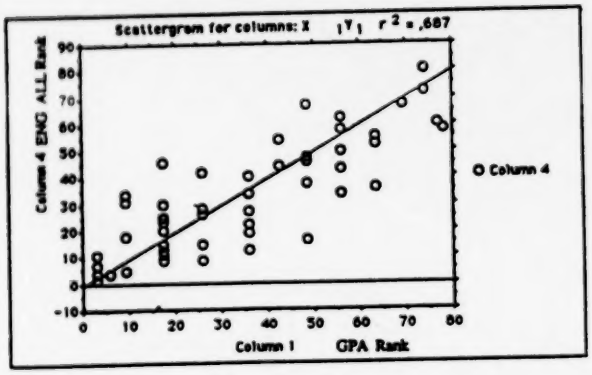
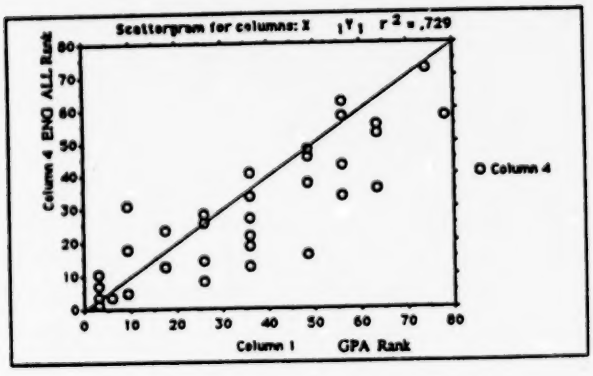


Figure 3.



Yet another way to group the students is on the bases of which CBLI class they participated in. Figure 3. shows the graph for the chemistry class. The x-axis is the English GPA rank as before, and the y-axis is the EngAll rank. The average improvement in rank is +6.015, and the 'p' value is 0.0029 which is very significant and the top students have not yet been removed from the data. Removal of the eight students with English GPA of 9.0 or better results in an average improvement in rank of 9.28 and a 'p' value of 0.0001 very highly significant. Similar results happened when the y-axis holds the rank values due to LC or TeEs.

For the CBLI Chemistry group (x-axis is Sophomore Eng. GPA)

y-axis	'p' value (all)	' p' value without top students
LC	0.0294	0.0106
TeEs	0.0144	0.0004
EngAll	0.0029	0.0001

Something appears to have affected a significant improvement in the English skills of the chemistry CBLI class as measured by comparing relative class rank (GPA) prior to the CBLI and matriculation examination results a year later.

The physics and computer groups do not show significant improvements. This result is somewhat baffling for the following reasons. First, the chemistry group was large (36 students) compared to the smaller physics (10) and computer classes (16). Second, the chemistry class involved mostly lectures, whereas the other classes had less lectures and more small group work. For example the computer classes (Pascal programming) involved 5 -10 min. introduction in English at the start of each class. This was followed by work in pairs at the computer. This small group work however was not useful in terms of CBLI because the use of English was optional, and the dominant language tended to be Finnish. The Pascal programming language was English, and any teacher assistance to the student pairs was also given in English.

Another possible explanation for the success of the chemistry group might be in the very fact that the lectures were in English. The use of the listeners second language in lectures might make them more interesting. The listening process needs to be more active because both the language and the chemistry are new, with the possible result that both are learned better. We were not able to make comparisons as to the amount of chemistry learned, but the students felt that the chemistry was learned at least as well as if it had been taught in Finnish (from the post-course questionnaires).